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APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO	CONFIRMATION NO
09/627,649	07/28/2000	GURTEJ SANDHU	11675.76.3	2213

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EXAMINER	
QUACH, TUAN N	

ART UNIT	PAPER NUMBER
2814	

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 7-...)

Office Action Summary	Application No. 09/627,649	Applicant(s) SANDHU ET AL.	
	Examiner Tuan Quach	Art Unit 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 February 2002* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a)☐ The translation of the foreign language provisional application has been received

Attachment(s)

1)☐ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
4)☐ Interview Summary (PTO-413) Paper No(s).
5)☐ Notice of Informal Patent Application (PTO-152)
6)☐ Other

DETAILED ACTION

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1 and 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeng (5,708,303).

being higher than the upper surface of line 58, and the lower surface of layer 78 being lower than the lower surface of line 58, as shown in Figs. 14-16, column 5 lines 33 to 56, column 6 lines 35-36. The provision of the upper layer of refractory metal nitride and of the optional oxide 56 is also taught, column 3 line 49-67. The use of this oxide although not shown in other embodiments would have been met given the teachings at column 3 lines 21-25 or alternatively, it would have been obvious to one skilled in the art to have included such liner as taught therein. Note that the single conductive material would correspond to the conductive lines in Jeng since the claimed invention would encompass multiple layer as in claim 4 lines 2-3. Such substitutition would have been further obvious as evidenced by the instant application page 9 lines 17-19 and the selection of such material would have been obvious and would not require any inventiveness.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Jeng ('303) as applied to claims 1 and 3-5 above above, and further in view of Jeng (5,486,493).

Jeng '303 is appled above and does not explicitly recite PTFE as the dielectric material.

Jeng '493 teaches the use of low dielectric constant material 20 between conductive lines 14a-14d comprising polytetrafluoroethylene. See column 1 line 48 to column 2 line 15, column 3 lines 29-65. The delectric constant between 1 and 3.9 is also taught. See column 6 lines 4-19.

It would have been obvious to one skilled in the art at the time the invention was made to have employed in Jeng '303 the particular PTFE dielectric material or material having low dielectric constant because such use is conventional and advantageous to improve device characteristics, e.g., to reduce line-to-line capacitance.

Claims 6-9, 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeng (5,708,303).

Jeng '303 shows conductive lines 62/58/60 on silicon oxide 66 and 64, low k dielectric material 78 located between adjacent lines 58, the upper surface of layer 78 being higher than the upper surface of line 58, and the lower surface of layer 78 being lower than the lower surface of line 58, as shown in Figs. 14-16, column 5 lines 33 to 56, column 6 lines 35-36. The provision of the upper layer of refractory metal nitride and of the optional oxide 56 is also taught, column 3 line 49-67. The use of this oxide although not shown in other embodiments would have been met given the teachings at column 3 lines 21-25 or alternatively, it would have been obvious to one skilled in the art to have included such liner as taught therein. Regarding the newly added feature in claim 6 of at least one side surface such would have been obvious as shown on the side surface of lines 58 as depicted in Figs. 14-16. Regarding claim 7, the side surface of the dielectric material, e.g., layer 78, in contact with the side surface of the lines is shown in Figs. 15 and 16.

Claims 14, 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeng (5,708,303) singly or in combination with Hyakutake

Jeng '303 shows conductive lines 62/58/60 on silicon oxide 66 and 64, low k dielectric material 78 located between adjacent lines 58, the upper surface of layer 78 being higher than the upper surface of line 58, and the lower surface of layer 78 being lower than the lower surface of line 58, as shown in Figs. 14-16, column 5 lines 33 to 56, column 6 lines 35-36. The provision of the upper layer of refractory metal nitride and of the optional oxide 56 is also taught, column 3 line 49-67. The use of this oxide although not shown in other embodiments would have been met given the teachings at column 3 lines 21-25 or alternatively, it would have been obvious to one skilled in the art to have included such liner as taught therein. Regarding the newly added feature at least one side surface such would have been obvious as shown on the side surface of lines 58 as depicted in Figs. 14-16. Tthe limitation regarding the silicon oxide on the titanium nitride not in contact with the side surface of the lines since the silicon oxide that is on the silicon oxide on the line 58 at portion adjacent layer 78 is in contact with the side contacting the layer 78. The inclusion of the oxide between the lines 58 and adjacent dielectric in structures shown in Fig.s 16-19 would have been further obvious as evidenced by layer 56 which corresponds to the incorporation of the optional liner delineated at column 3 lines 11-26. In addition, Hyakutake shows the formation of the subsequent dilectric to on the gap filling dielectric, Figs. 3 –5 wherein the silicon oxide 107a is provided over the lines 109, followed by the provision of dielectric 108a including planarization by etch back to provide flat surface prior to depositing upper dielectric 109a It would have been obvious to have included optional oxide and the

planarization of the gap filling dielectric to the oxide surface prior to completing the subsequent dielectric layer to provide planarization as taught by Hyakutake.

Claims 10 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeng ('303) singly or with Hyakutake as applied to claims 6 and 14 above, and further in view of Jeng (5,486,493).

Jeng '303 is appled above and does not explicitly recite PTFE as the dielectric material.

Jeng '493 teaches the use of low dielectric constant material 20 between conductive lines 14a-14d comprising polytetrafluoroethylene. See column 1 line 48 to column 2 line 15, column 3 lines 29-65. The delectric constant between 1 and 3.9 is also taught. See column 6 lines 4-19.

It would have been obvious to one skilled in the art at the time the invention was made to have employed in Jeng '303 the particular PTFE dielectric material or material having low dielectric constant because such use is conventional and advantageous to improve device characteristics, e.g., to reduce line-to-line capacitance.

Claims 4, 12, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jeng '303 singly or with Hyakutake as applied to claims 1, 6 and 14 above, and further in view of Homma et al.

Jeng '303 as applied above does not recite all the various conductive materials such polysilicon, aluminum, copper, tungsten, and multiple layers of TiN/Al/TiN, TiN/Al/Ti, W/TiN/Ti, or any combinations thereof

It would have been obvious and would have been within the purview of one skilled in the art to have employed the materials enumerated since such correspond to typical aluminum material or other conventional conductive materials as acknowledged in the specification pages 17-19, and since such substitution of well known conductive materials is well within the purview of one skilled in the art as evidenced by Homma et al., column 5 lines 21-25. Copper is a well known conductive material and its use in the list enumerated would have been obvious.

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-5 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-9 of U.S. Patent No. 6,107,686. Although the conflicting claims are not identical, they are not patentably distinct from each other because it would have been obvious and apparent that the claim language in the instant claims, e.g., claim 1 line 2 reciting "a first dielectric layer" would encompass the single first dielectric layer situation as well.

Claims 6-18 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-9 of U.S. Patent No. 6,107,686 in view of Jeng '303.

These claims, in addition to the limitations in claims 1-5, further recite the upper surface having a layer of refractory metal nitride, e.g., claim 6 lines 12-13, or of titanium nitride in claim 14 lines 12-15 and the second dielectric thereon being silicon dioxide.

Jeng '303 shows conductive lines 62/58/60 on silicon oxide 66 and 64, low k dielectric material 78 located between adjacent lines 58, the upper surface of layer 78 being higher than the upper surface of line 58, and the lower surface of layer 78 being lower than the lower surface of line 58, as shown in Figs. 14-16, column 5 lines 33 to 56, column 6 lines 35-36. The provision of the upper layer of refractory metal nitride and of the optional oxide 56 is also taught, column 3 line 49-67. The use of this oxide although not shown in other embodiments would have been met given the teachings at column 3 lines 21-25 or alternatively, it would have been obvious to one skilled in the art to have included such liner as taught therein.

Accordingly, it would have been obvious to one skilled in the art to have employed in the claimed invention the further provision of refractory metal nitride including the oxide thereon since such is conventional and advantageous as taught by Jeng '303 wherein the upper metal nitride would serve as a capping layer and the silicon dioxide layer would serve as conformal liner thereon.

Applicant's arguments with respect to claims 1-18 have been considered but are

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Quach whose telephone number is 703-308-1096. The examiner can normally be reached on M-F from 9 to 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached on (703) 306-2794. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956